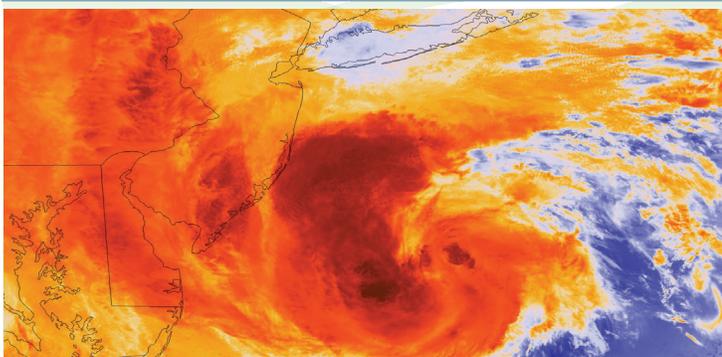




# NOAA in the North Atlantic



## Sandy's Legacy – Improved Storm Surge Prediction Tools

*Hurricane Sandy highlighted the need for improved coastal storm surge prediction tools. NOAA's North Atlantic Regional Team (NART) is working across NOAA and other federal agencies to develop innovative new solutions so we're better prepared the next time a major storm hits our region.*

### What Happened?

On October 29, 2012, Hurricane/post-tropical storm Sandy hit the Mid-Atlantic, bringing 90 m.p.h. wind gusts and storm surges of up to 20 feet. When the water receded a week later, damage assessments exceeded \$50 billion, making Sandy the second costliest storm in U.S. history. The National Hurricane Center estimated that Sandy directly caused 147 deaths. Sandy damaged or destroyed at least 650,000 houses, impacted 24 states and left about 8.5 million customers without power.

Storm surge from Sandy forced historically high coastal water levels from Georgia to Maine and created the indelible images of devastation we saw on television. For example, Sandy sent a record 14-foot storm surge into New York Harbor, flooding subway tunnels and airports and closing the stock market for two days, the first time that's happened for weather-related reasons since 1888.

NOAA did as well as can be expected with such a momentous storm. Thanks to regular post-storm reviews – or service assessments – conducted by the National Weather Service, we've learned from past events and made significant improvements.

Peyton Robertson, the NART Lead, led the service assessment for Sandy. The assessment includes 23 recommendations for improvements, identifying better storm surge forecasts as the highest priority. Although surge forecasts for Sandy were available two days before the storm, the team found that officials in New York and New Jersey needed information sooner and in more user-friendly, unified formats, including GIS maps and warnings that provide specific local impacts.

### What is the NART doing to help?

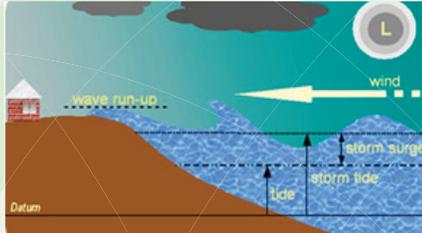
The NART is seeding cross-NOAA projects in our region to improve predictions of local impacts for high-impact coastal storms such as Sandy. One such project is the development of a wave run-up model led by the Taunton (Mass.), Caribou (Maine), and Gray (Maine) Weather Forecast Offices (WFOs), in cooperation with the National Centers for Environmental Prediction and the National Ocean Service's Coast Survey Development Laboratory. The NOAA team is testing and calibrating a new wave run-up prediction model developed by Dr. Hilary Stockdon of the U.S. Geological Survey for use in the North Atlantic.

### What does this model predict?

The Stockdon Model predicts two primary effects of wave action, wave setup and wave run-up. Wave setup is the additional rise of water along the shore line resulting from breaking waves piling up water faster than it can retreat back to the ocean. After a wave breaks, the broken wave continues to travel shoreward then up the beach as a turbulent wave bore or swash. This process is referred to (cont. p.2)

(cont. from p.1) as wave run-up. The Stockdon Model uses deep water wave height, wave period, and beach slope for input to predict these parameters.

Both storm surge and wave action are dependent on beach slope and near shore bathymetry, but in opposite ways.



The steeper bathymetry characteristic of the North Atlantic coastline tends to minimize storm surge while increasing wave action.

“Wave run-up and storm surge pack a powerful one, two punch,” said Rich Okulski, Meteorologist-in-Charge for the Caribou WFO. “One foot of water traveling at 10 miles per hour will produce the force equivalent to 280 mph wind.”

#### How will this new model help?

While National Weather Service warning products predict storm surge levels, the additional increase in water level due to wave setup and the effects of wave run-up are not yet included.

“We are at high risk due to our reliance on sand dunes as natural barriers in many parts of the region,” says Okulski. “Coupling Dr. Stockdon’s model with a method developed by her colleague A.H. Sallenger, we can actually predict erosion or failure of the dune structure. This provides information to emergency managers before an event.”

With the support of NART funds, Dr. Stockdon will be visiting the North Atlantic region later this summer to meet NOAA principals. For more information about this project, contact [Richard.Okulski@noaa.gov](mailto:Richard.Okulski@noaa.gov).

## NOAA New England Roundtables

NOAA’s Office of Coastal Resource Management (OCRM) and Coastal Services Center (CSC) held four targeted roundtable meetings in New England between February and May 2013 to increase regional coastal management partnerships, as well as awareness of and access to NOAA regional resources.

Each roundtable agenda was developed in conjunction with the State Coastal Management, National Estuarine Research Reserve, and Sea Grant Programs – leading to variation in topics based on state interests. State interests were broad enough to include presentations by National Ocean Service, National Marine Fisheries Service, Office of Ocean and Atmospheric Research, and National Weather Service.

During coastal inundation forecasts conversation with Rhode Island and Connecticut, roundtable participants identified



next steps including having the National Weather Service partner with state Sea Grant programs to: improve communication with local governments about impending storms; explore the feasibility of adding probability to NOAA inundation forecasts; and work with the states to review the accuracy of current inundation maps. These action items will help the NOAA achieve its goal of increasing effective communication about potential storm severity, while also working towards state goals in Southern New England of decreasing loss of life, property, and related impacts from a storm event.

NART supported travel costs for some NOAA personnel attending the New England Roundtables. For additional information on the roundtables, including a complete list of the topics, please contact [Rebecca.Newhall@noaa.gov](mailto:Rebecca.Newhall@noaa.gov) or [Adrienne.Harrison@noaa.gov](mailto:Adrienne.Harrison@noaa.gov).



## Sharing Climate Change Adaptation Practices

A year-long Sea Grant partnership with the NART is helping coastal communities identify low-cost, innovative ways to address climate change at the local level.

In 2012, Sea Grant joined up with NOAA's North Atlantic Regional Team to survey more than two dozen local communities from Virginia to Maine on their adaptation practices. The team looked at studies, laws, policies, outreach tools, and infrastructure investments that were voluntarily adopted by local governments and developed a report to share this information more broadly.

Towns emphasized the importance of using existing processes and plans to respond to coastal hazards. Incorporating climate change information into comprehensive and hazard mitigation plans was an easy first step since most towns already have budgets to prepare these plans. Often these efforts are led by town staff or citizen volunteers, but more sophisticated planning requires funding, technical assistance, and partnerships with entities like NOAA, other federal and state agencies, and non-governmental organizations.

Bowers, Delaware, recently took the radical step of completely rezoning its downtown to relocate their commercial district to a less flood-prone part of town. They are not alone in looking outside the box for remedies to adapt to climate change.

New York City formed a partnership with the Nature Conservancy to develop a GIS-based sea level rise visualization tool for Long Island Sound, then reached out to neighboring communities including Guilford, Connecticut to share what they learned. Such cross-community pollination efforts are spreading successes and leading to more effective adaptation planning.

The Cost Efficient Climate Change Adaptation in the North Atlantic report inventories these and other examples of how municipalities have been responding to these threats. You can view the report in its entirety at [www.regions.noaa.gov/north-atlantic/](http://www.regions.noaa.gov/north-atlantic/)

Contact Connecticut Sea Grant Director Sylvain Deguise at [sylvain.deguise@uconn.edu](mailto:sylvain.deguise@uconn.edu) for more information.

## DID YOU KNOW?

During the spring and summer, NOAA Ship *Thomas Jefferson* will be continuing its work contributing to the multi-state, multi-agency Long Island Sound seafloor mapping initiative as well as mapping the approaches to New York to update nautical charts of the area. In June, the vessel began extensive post-Sandy surveys in Delaware Bay to assess changes in the seafloor there.

NOAA Ship *Ferdinand Hassler* was upgraded and repaired this spring and will begin surveying the approaches to the Chesapeake Bay in July before heading to her new homeport in New Castle, New Hampshire later in the summer. Once there, *Hassler* plans to survey approaches to New Hampshire and conduct some tests and evaluations of a new autonomous underwater vehicle (AUV) for surveying.

## NOAA People in the North Atlantic Region

### NART Member

**Kevin Friedland** is a member of the Ecosystem Analysis Program of the Northeast Fisheries Science Center, stationed in Narragansett, Rhode Island. He received a B.A. from Rutgers College and a PhD from the Virginia Institute of Marine Science, College of William and Mary. Kevin has also been a member of the population dynamics group in Woods Hole, Mass., the behavioral ecology group in Sandy Hook, N.J., and the menhaden assessment group in Beaufort, N.C.



Kevin has published over 100 papers in the peer-review literature and has edited two books, one on stock identification and another on fisheries conservation. During his professional career he has done research on menhaden, bluefish, sea herring, sturgeon, eel, cod, haddock, and salmon. His publications cover a range of topics including: estuarine ecology of fishes, fisheries oceanography, climate change, and many more. His current research is on the effects of growth on the maturation and survival of Atlantic salmon and the factors controlling the recruitment of cod and haddock. For the NART, he has been a key player in supporting cross line office ecosystem science projects in the region.

#### NART Background

The NART is one of eight regional teams created by NOAA's Regional Collaboration effort. It is composed of 17 members from five line offices and is currently led by Peyton Robertson. Nicole Bartlett is the NART Regional Coordinator. For more information on team members and activities visit: [http://www.regions.noaa.gov/north\\_atlantic](http://www.regions.noaa.gov/north_atlantic)

## NOAA Places in the North Atlantic Region

Jacques Cousteau

National Estuarine Research Reserve

The Jacques Cousteau National Estuarine Research Reserve (JC NERR) is located in southeastern New Jersey within the Mullica River-Great Bay ecosystem. The JC NERR is one of 28 reserves in the National Estuarine Research Reserve System, a network of protected sites managed by state entities in partnership with NOAA, which provides the funding to support the system. The mission of the JC NERR is to improve management of New Jersey coastal environments by combining science, education, and stewardship. To achieve this goal, the JCNERR provides research and education opportunities and practical information for coastal decision makers.

The JC NERR is administered by Rutgers University and encompasses more than 115,000 acres including upland and lowland forests, freshwater and salt marsh, barrier islands, shallow bays and the coastal ocean. Less than 1% of the Reserve includes human development, making the JC NERR one of the least disturbed estuaries in the densely populated urban corridor of the Northeastern United States. Properties within the Reserve are owned by various state and federal entities.

In 1997, the reserve was named after the renowned oceanographer and film maker Jacques Y. Cousteau who has died that year at the age of 87.

The Reserve is managed by Michael P. De Luca. For more information about the Reserve, including interactive tours and how to visit, go to <http://marine.rutgers.edu/pt/>



Cousteau Reserve coastline (photo courtesy JCNERR)